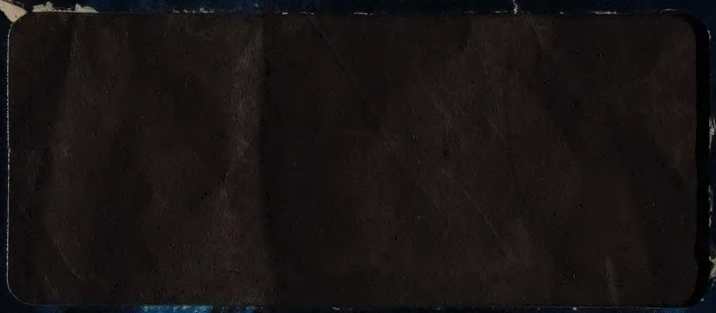
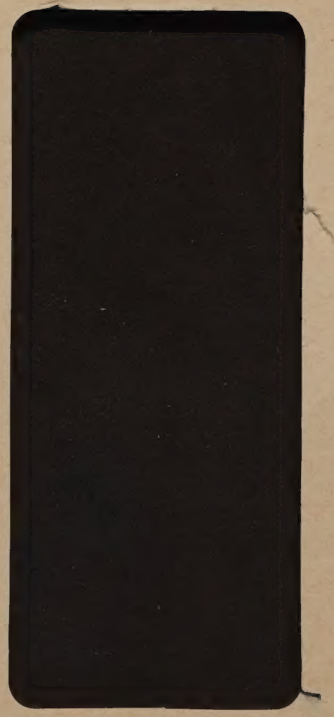
LeCroy



instrumentation
for the study of
transient phenomena

PALO ALTO, CA.



technical information manual

CAMAC MODEL 8658

Video Digitizer Display Model

WARRANTY

All LRS instruments are guaranteed to operate within their specifications for one year from the date of purchase. Under this warranty, any unit which fails to perform within specifications, as a result of defects in workmanship or materials, will be restored to specified operating condition free of charge except for shipping costs involved in the return of the unit to the factory.

In order that this warranty be considered valid, it is necessary that the LRS Warranty Card which accompanies the unit on delivery be completed and returned to the factory within 30 days of receipt of equipment.

All questions concerning repairs or replacement parts should be addressed directly to factory's Quality Control Manager. This procedure will insure the fastest possible service. Please include the Model Type, Serial Number, and ECN (Engineering Change Number) with all requests for parts or service.

ENGINEERING DEPARTMENT
LeCroy / CALIFORNIA
PALO ALTO, CALIFORNIA

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ENGINEERING DEPARTMENT
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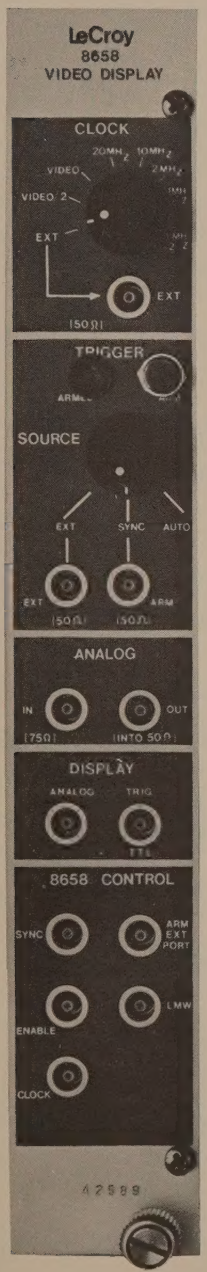
PALO ALTO, CALIFORNIA

TECHNICAL DATA

LeCroy



CAMAC Model 8658

Video Digitizer Display Module

- **Enables Display of Full Frames of Digital Video**
- **Synchronizing Frames and Display**
- **Enables Display of up to 25.6 seconds of Information**
- **Standard Waveform Digitizer Capabilities**

The LeCroy Model 8658 is a companion module to the 8258 video digitizing system. The module provides a crystal based data taking clock at switch selectable rates including the appropriate frequency to exactly fill the available memory with 1 field or 1 frame of video data (European format also available). The internal triggering circuit synchronizes the start of data taking with the beginning of a video frame, an external trigger, a front panel pushbutton, or a computer command.

The data stored in the 8258 system is accessed and displayed in analog form by the 8658 module. For video signals, it is assumed that the synchronization information is digitized. Then the display output will drive a standard TV monitor (European or American). Otherwise the display trigger out facilitates viewing of analog signal on a standard oscilloscope.

The Model 8658 together with the 8258 Video Digitizer and a selectable number of 8800 memory modules (up to 64) of 32K words each provides a fast high resolution stand alone "frame grabber" video record and display system interfaced to any of the standard available computers through an off the shelf CAMAC interface/controller.

Frame rates of up to 100 cps can be taken before stopping on a single frame for computer analysis. High reliability and compactness (single 19" rack mount 8" high) further enhance the usability of this totally solid state system.

October 1979

Instrumentation for the study of transient phenomena

LeCROY RESEARCH SYSTEMS OF CALIFORNIA • 1806 Embarcadero Rd. • Palo Alto, California 94303
TELEPHONE: (415) 856-1800 TWX: 910-373-1791

8658 Technical Specifications

ANALOG CHARACTERISTICS

Input: 75 Ω Impedance (50 Ω optional), LEMO Connector (Slip sleeve connector).

Input Range: 1.4 V.

Output: Analog signal to 8258. Full scale 512 mV.

CLOCK CHARACTERISTICS

Internal: Crystal controlled .5, 1, 2, 10, 20 MHz. Video rate (128K words of memory equals 1 field). Video rate/2 (128K words equals 1 frame). European frequencies also available.

External: 50 Ω input impedance, TTL level signal, leading edge triggers, 500 kHz to 20 MHz clock rates permissible.

TRIGGER CHARACTERISTICS

ARM: Push button manually arms the system in preparation for a trigger. System rejects triggers if not armed. Arm can be accomplished by computer command F(9), or an external signal.

Source—

Sync: Vertical synchronization pulses are detected and used to trigger the digitizing of the video picture. The display will then correspond to an integer number of fields and be synchronized with the beginning of the data. Requires arming.

Ext: External TTL pulse initiates digitizing. Input 50 Ω coaxial LEMO connector. Requires arming. Minimum duration 100 ns.

Auto: Automatic initiation of digitizing as soon as armed.

DISPLAY CHARACTERISTICS

Analog Out: Drives standard TV monitor. Synch information and interleaving depend on digitizing flyback information and synch pulses. No internal regeneration. Also drives scope for non-video viewing.

Trigger Out: TTL output pulse to drive external scope trigger to view stored data on any scope. Useful in non-video data taking.

8258 CONTROL SIGNALS

Sync: Unit derives a logic TTL signal as input to the 8258 module to set the sync. bit (9th bit) in the memory during flyback and synchronization time.

Enable: As soon as the trigger fires this signal clamps high and enables the digitizer until the memory is full at which time the Last Memory Word (LMW) pulse is returned from the 8258 resetting the Enable state.

Clock: The internal or external clock generated by the 8658 is fed to the 8258 through this connector.

Arm External Port: When the last memory word signal (LMW) is fired, the data taking ends and the external port of the 8258 is armed for display by the signal from this connector.

LMW: Last Memory Word Signal is an input to the 8658 from the 8258 to initiate transfer to the display mode.

CAMAC CONTROLS

CAMAC Commands: Z or C: Disables arm and external port.
X: An X=1,(command accepted) response is generated when a valid F&N are generated.

CAMAC FUNCTIONS

F(1): Read Clock position and source switch setting. Required N.

F(9): ARM the system via the Dataway. Requires N and S2.

F(25): Provide a TRIGGER via the CAMAC dataway. Requires N and S2.

Packaging: In conformance with CAMAC standard for nuclear modules (IEEE Report #583, or European ESONE Reports #EUR4100e, EUR46003). RF-shielded CAMAC #3 module.

Current Requirements: In conformance with CAMAC specifications on a per slot assessment. See above publications for details.

ADDENDA LRS 8658

does not apply we have 128k

1. Operational Constraints in Two Memory Module (64K) Systems.

   a. 20MHz and VIDEO clock settings are not valid ... digitization frequencies.

   b. VIDEO/2 clock setting should always be selected when displaying data.

3. PRODUCT DESCRIPTION

3a. FRONT PANEL DESCRIPTION

1. Analog Signals

ANALOG IN :Composite Video input. (1.5Vpp, Z_i=75Ω)

OUT :8258 compatible composite video (512mVp-p into 50Ω).

DISPLAY OUT :Reconstructed composite video. (1.5Vp-p into 75Ω).

TRIG :Rising edge at 1st memory word reconstructed.(TTL into 50Ω).

2. System Clock

VIDEO :500 samples per scan line

VIDEO/2 :250 samples per scan line

EXT :External clock

20MHz-0.5MHz :Crystal controlled sampling rates

EXT :External clock input. Rising edge clocks. fmax=20MHz fmin=0.5MHz(TTL,Z_i=50Ω).

FREQ SYNC :Frequency adjust for VIDEO and VIDEO/2 clocks.

3. Trigger

ARM :Push button trigger arm

ARM :External trigger arm.(>,100ns TTL, Z_i=50Ω)

ARMED :Trigger status LED

SOURCE

AUTO :Trigger automatically when armed

SYNC ;Trigger synchronized to composite video field sync signal.

EXT :Trigger externally

EXT :External trigger (>,100ns TTL,Z_i=50Ω)

4. Control

CLOCK	:System clock output (TTL into 1KΩ)
ENABLE	:Enable LRS 8258 digitizer (TTL into 1KΩ)
SYNC	:Line or field sync signal detected (TTL into 50Ω)
ARM EXT PORT	:Enable LRS 8258 external DMA port (TTL into 50Ω)
L.M.W.	:Last system memory word addressed by LRS 8258 (TTL, Z_i=2KΩ)

3b. REAR PANEL DESCRIPTION

1. Data Port

EXTERNAL PORT :DMA Data Port to LRS8258

PIN	SIGNAL
1	Port Data Sync Bit
3	PD7
5	PD6
7	PD5
9	PD4
11	PD3
13	PD2
15	PD1
17	PDØ(LSB)
19	PCLOCK

All even pins are ground.

3c. CAMAC CONTROL

Z or C :Disable Trigger

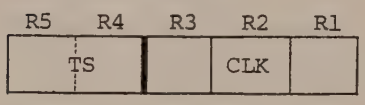
F(1) :Read LRS8658 switch register

F(9) :ARM LRS8658

F(25) :Trigger LRS8658 (System must be armed)

X=1 :Response for valid F & N

Switch Register



TRIGGER SOURCE	EXT	SYNC	AUTO
TS	Ø	1	2

CLOCK	EXT	VID/2	VID	20MHz	10MHz	2MHz	1MHz	0.5MHz
CLK	Ø	1	2	3	4	5	6	7

4. OPERATIONAL DESCRIPTION

4a. GENERAL

The LRS 8658 Video Display Module performs the control and display functions of the LRS Video Digitizing System. This system (Fig.1) also includes the LRS 8258 Video Digitizer and multiples of LRS 8800/9 Memory Modules. Self-contained, this can be used as a stand alone instrument,or interfaced to an external system via CAMAC.

Connected to a source of composite video data, the 8658 synchronizes the 8258 digitizer to the signal, determines the sampling rate and, when system memory is exhausted, enters the display mode. During display memory is accessed cyclically and the original information is reconstructed, for presentation on a monitor. A glossary of standard video terminology is provided in section 5d.

Digitization of the composite video permits subsequent regeneration including all the timing information of the source. Thus, the system coupled,with a monitor compatable with the video source, will display data from non-standard scanning systems.

4b. SYSTEM CLOCK

The 8658 clock defines the system's digitization rate. For standard composite video, (NTSC,PAL,PAL-M) two clocks are provided for storage and display of an integral number of fields in system memory. The VIDEO rate requires 128K words per field, approximately 500 samples per scan line. VIDEO/2 requires 64K words per field or 250 samples per scan line. Front panel frequency adjustment (FREQ SYNC) is provided for specific applications.

Five Crystal-based clocks allow convenient use of an 8658-controlled system as a high performance transient recorder. Sampling rates up to 20 MHz (50ns) with better than $\pm$30psec intersample time correlations are available.

An external clock source permits intersystem sample correlations in multiple transient recorder or real time applications. The LRS 8658 clock timing specifications are typically met with an uninterrupted clock.

4c. DISPLAY CLOCK

LRS 8658 display signal reconstruction is a function of the system clock. Selection of a video clock results in display signal generation at the same rate, thus, the timing is that of the original signal.

Selection of any other rate (crystal 0.5-20MHz clocks or an external source) results in reconstruction at the VIDEO rate (∿8MHz). Therefore the display signal timing will not be that of the original signal.

4d. TRIGGER

System synchronization is established by the LRS 8658 trigger. This requires arming before the triggering event-and should be preceeded by resetting all other system components.

The triggering may be selected from an automatic, synchronized or external event. Synchronized triggering enables digitization at the time of a field sync signal at the Analog input. This mode should be selected if subsequent data display on a video monitor is required.

4e. SYSTEM CONNECTION

1. Analog

ANALOG IN :Video Source

OUT :LRS8258 Analog Input

DISPLAY OUT :Video Monitor

2. Control

LRS 8658	LRS 8258
CLOCK	CLOCK
ENABLE	ENABLE
SYNC	SYNC
ARM EXTERNAL PORT	ARM EXTERNAL PORT
L.M.W.	L.M.W.
EXTERNAL PORT	EXTERNAL PORT (Rear Panel)

All references are with respect to LRS 8658.

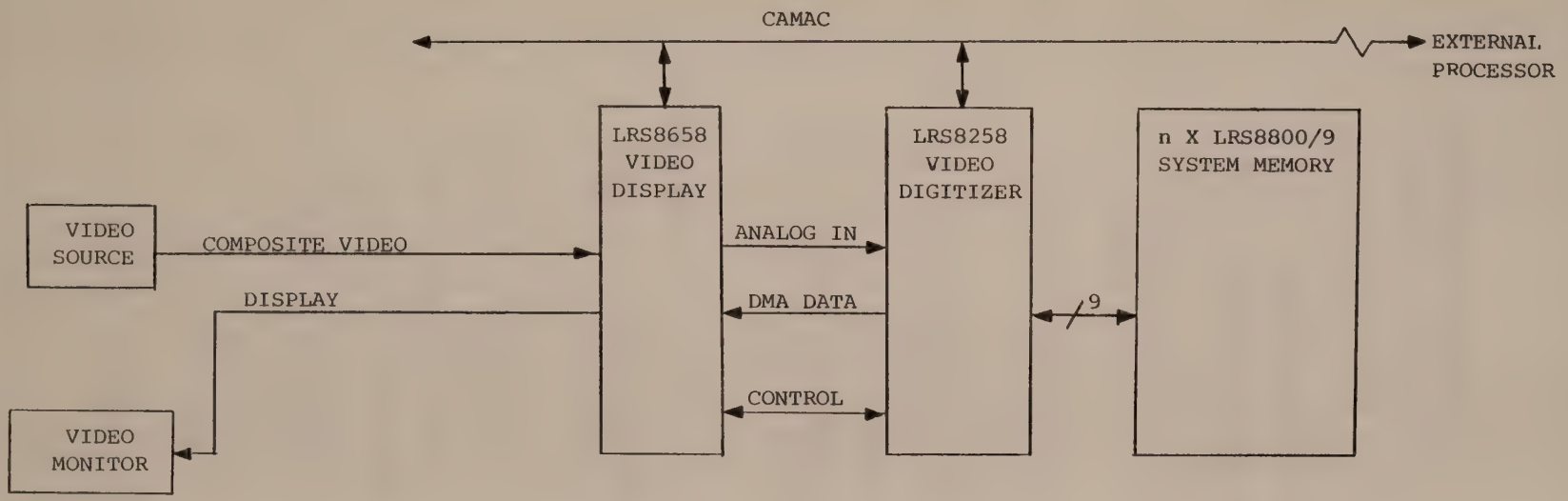


Figure 1.

LRS VIDEO DIGITIZING SYSTEM

5. FUNCTIONAL DESCRIPTION

5a. GENERAL

The LRS 8658 consists of a controller for the LRS 8258 and a display circuit for reconstruction of the digitized signal. In video applications this signal includes line and field sync timing and blanking levels composed with the video. Subsequent display by the LRS 8658 requires that a single field or integer multiples of a frame fill memory. This constraint defines the the video clock rate:

System Clock Frequency = system memory words X Field Frequency

The Nyquist condition, requiring a minimum sampling rate of twice the signal bandwidth for complete reconstruction, places a lower limit on the clock frequency. Video standards (NTSC,PAL,PAL-M) specify 4MHz nominal bandwidths. These require an 8MHz minimum system clock for full information retrieval.

5b. CONTROLLER

Control of the LRS Video Digitizing System requires a system clock, signal conditioning, and digitizer enabling.

The system clock is selected (5b) from Video, crystal-controlled and external sources. The video clock is generated by a stabilized voltage controlled oscillator (2F) with fine tuning capability (FREQ. SYNC.). Determination of the VIDEO or VIDEO/2 frequency is described in Section 5a. The crystal-controlled clocks are derived from a 20MHz timebase (5d).

Signal conditioning consists of impedance matched attenuation of the video source signal. Detection of line and field sync signals is accomplished by amplitude (2H) and timing (3H,4H) descrimination. Threshold level may be adjusted by R24.

In the Armed state (5e.5), the system clock (5b.6) and trigger source selector (4f) are enabled. Arming starts a one shot (3d.13) providing an automatic trigger if selected. Synchronous triggering on a video field sync signal is provided by 3g.13.

The trigger event, synchronized with the system clock (4h.9), initiates a digitization sequence. When system memory is filled (3e.10) the LRS 8658 resets, disables sampling and enters the display mode.

5c. DISPLAY

The rising edge of L.M.W. (3e.9) enables the selected video clock (4d.9) and starts an 8 μsec delay (3i.12). This provides for system memory setup by the LRS 8258. At the end of the delay, the DMA external port is enabled (3i.4) and the port clock gated on. Data from successive memory locations are latched into a high speed DAC (1c). The output (1f) provides a reconstructed composite video signal. This sequence repeats until the LRS 8258 is reset.

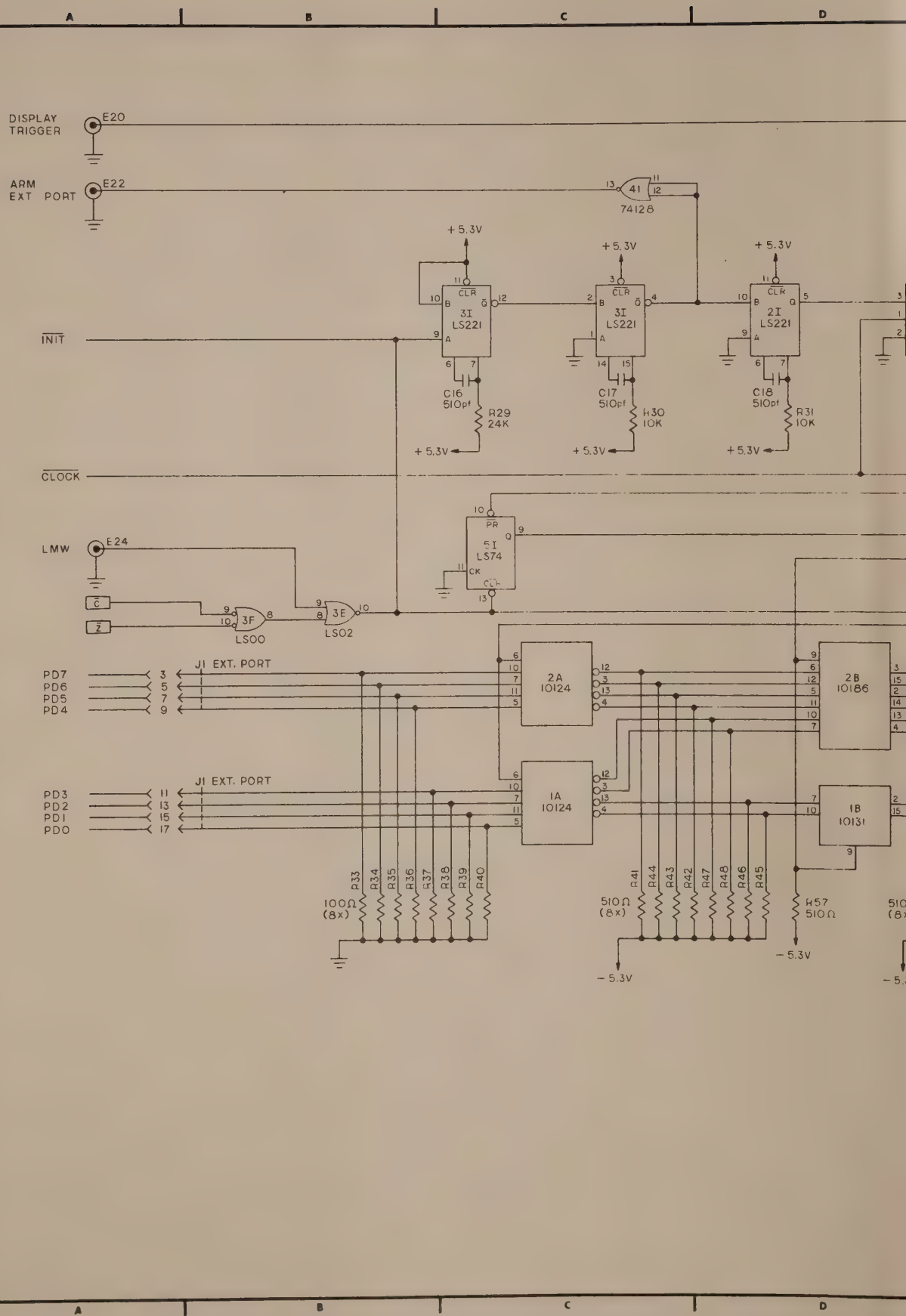
5d. GLOSSARY OF VIDEO TERMINOLOGY

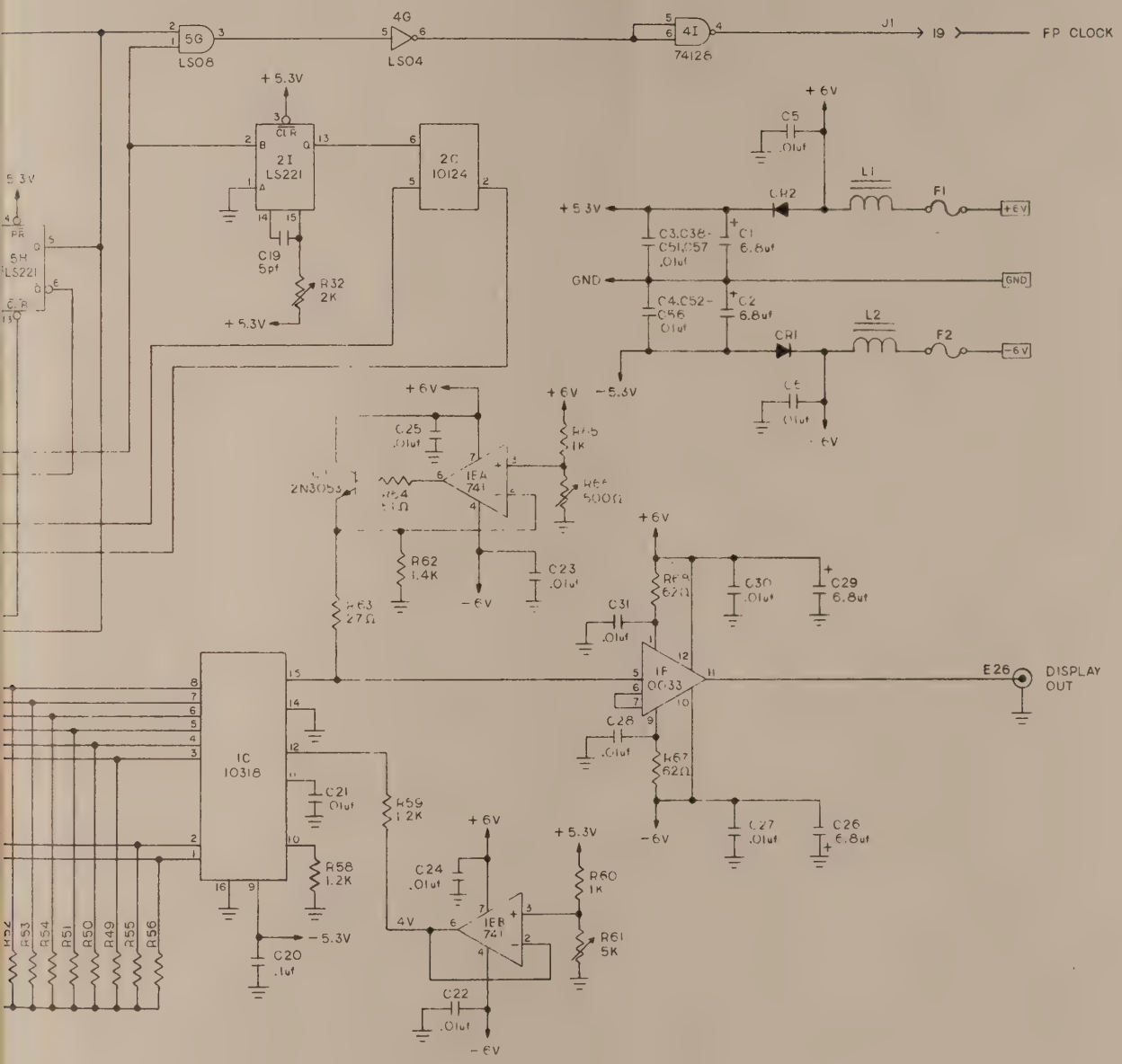
COMPOSITE VIDEO:	The video signal combined with all blanking and synchronizing signals.
COMPOSITE SYNC:	The combined line and field synchronizing signals.
FIELD:	One of the two (or more) equal parts of information into which a frame is divided in interlace scanning.
FIELD FREQUENCY:	The rate at which one complete field is scanned.
FIELD SYNC:	Synchronization signal at the end of each field.
FRAME:	One complete picture, consisting of two interlaced fields.
INTERLACE:	Technique of combining two fields, each providing alternate lines, to form a frame.
LINE:	An individual scan.
LINE SYNC:	Sychronization signal at the end of each line.
VIDEO:	The image intensity signal from a scanning detector system.

REPRESENTATIVE VIDEO STANDARDS:

1. NTSC
   - Frame: 525 lines
   - Field: 262.5 lines
   - Field Period: 16.68 msec
   - Line Period: 63.56 µsec

2. PAL
   - Frame: 625 lines
   - Field: 312.5 lines
   - Field Period: 20 msec
   - Line Period: 63.5µsec


DISPLAY TRIGGER
E20
ARM EXT PORT
E22
74128
+5.3V
3I LS221
2I LS221
INIT
C16 510pf
C17 510pf
C18 510pf
R29 24K
R30 10K
R31 10K
CLOCK
5I LS74
LMW
E24
3F
LS00
3E
LS02
J1 EXT. PORT
PD7
PD6
PD5
PD4
PD3
PD2
PD1
PD0
2A 10124
1A 10124
2B 10186
1B 10131
R33
R34
R35
R36
R37
R38
R39
R40
100Ω (8x)
R41
R44
R43
R42
R47
R48
R46
R45
510Ω (8x)
R57 510Ω
-5.3V



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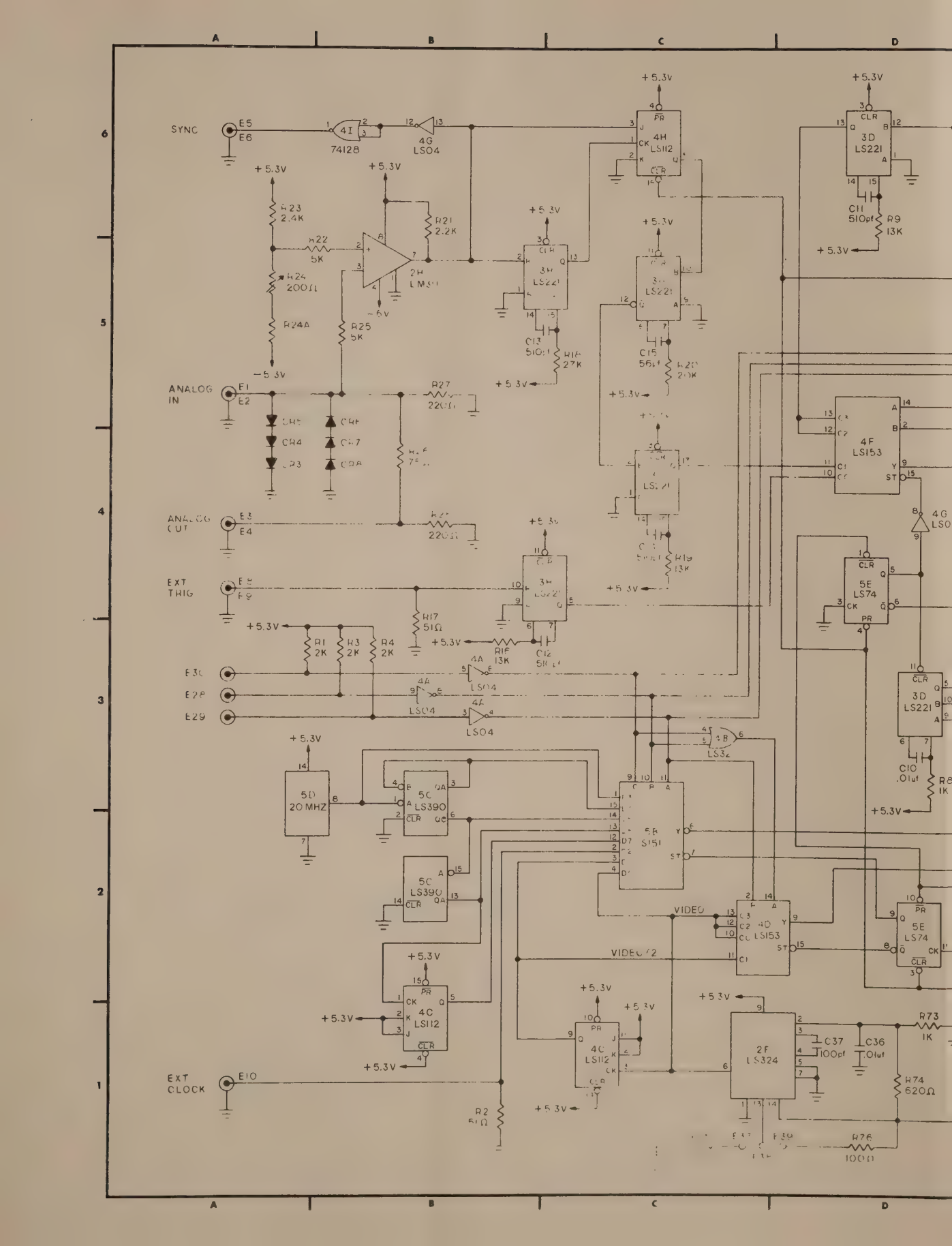
DRAWN WL	SCHEMATIC DIAGRAM
CHECKED TG	8658 REV C
DATE 1/22/80	VIDEO DISPLAY
DRAWING NUMBER 8658	SHEET 1 OF 2
ECO NO	DATE


SYNC
E5
E6
74128
4G
LS04
+5.3V
R23
2.4K
R22
5K
R24
200Ω
R24A
R25
5K
R21
2.2K
2H
LM311
-5.3V
ANALOG
IN
E1
E2
R27
220Ω
CR5
CR4
CR6
CR7
CR3
CR8
ANALOG
OUT
E3
E4
EXT
TRIG
E7
E8
R1
2K
R3
2K
R4
2K
R17
51Ω
R18
13K
C12
5Ωuf
E30
E28
E29
4A
LS04
4F
LS04
4B
LS32
4H
LS112
3H
LS221
3D
LS221
C11
510pf
R9
13K
C13
510pf
R16
27K
C15
56pf
R20
20K
C14
5Ωuf
R19
13K
4F
LS153
4G
LS0
5E
LS74
3D
LS221
C10
.01uf
R8
1K
5D
20 MHZ
5C
LS390
5C
LS390
5B
S151
VIDEO
VIDEO/2
4D
LS153
5E
LS74
4C
LS112
4C
LS112
2F
LS324
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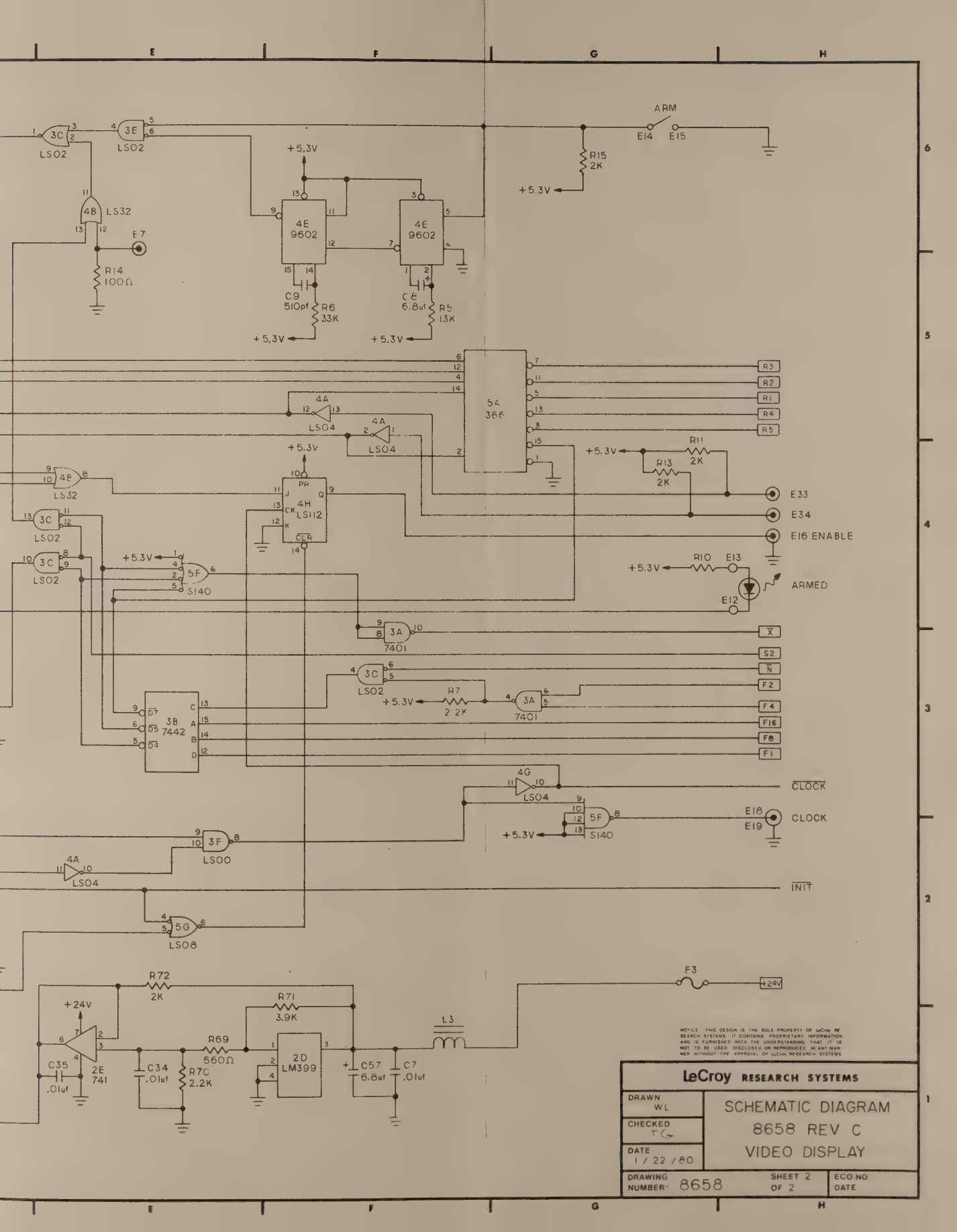
CLOCK
E10
R2
51Ω



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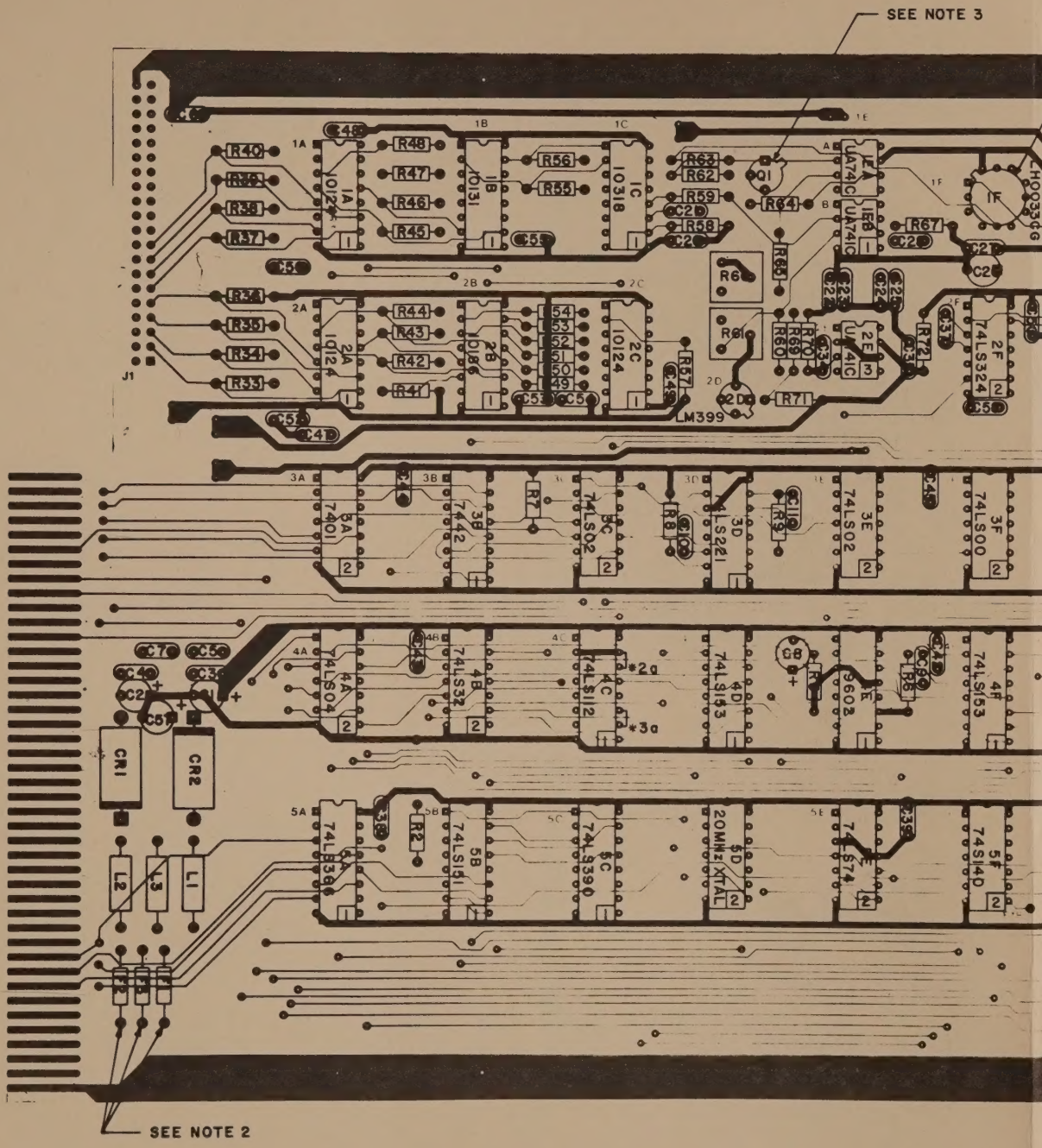
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SEE NOTE 2
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LM399
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R36
R33
R44
R43
R42
R41
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1B 1013
1C 10318
2A 10124
2B 10136
2C 10124
1E UA741C
1F
2E UA741C
2F 74LS324
3A 7401
3B 7442
3C 74LS02
3D LS221
3E 74LS02
3F 74LS00
4A 74LS04
4B 74LS32
4C 74LS112
4D 74LS153
4E 9602
4F 74LS153
5A 74LS38
5B 74LS151
5C 74LS390
5D 20MHz XTAL
5E 74S74
5F 74S140
CR1
CR2
L1
L2
L3
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
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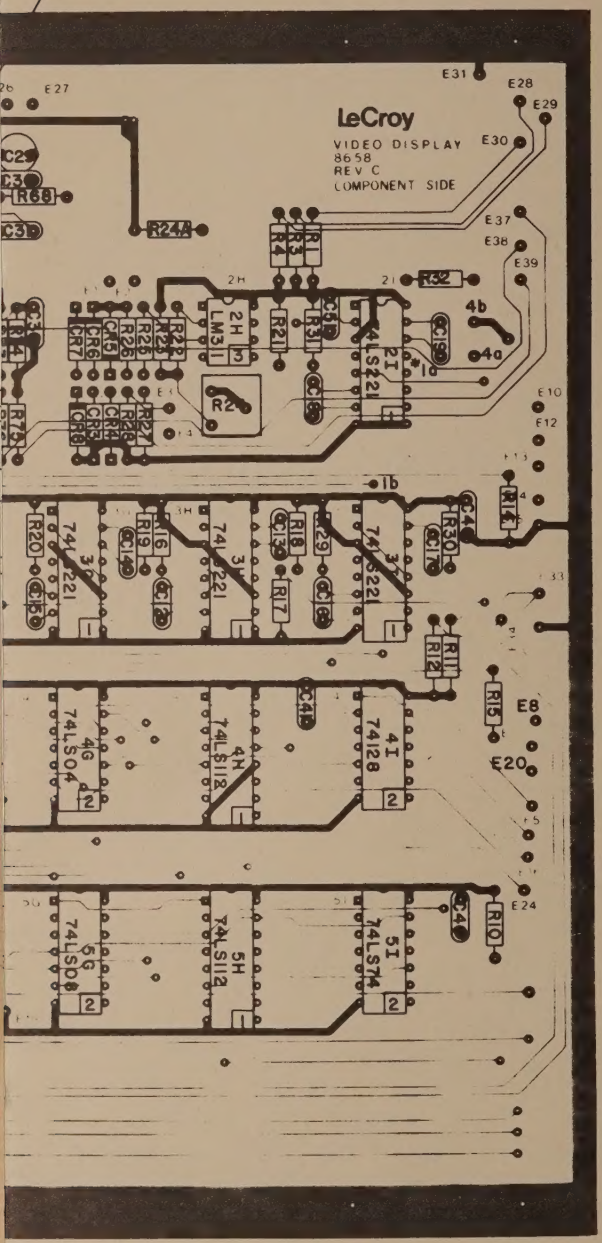
SEE NOTE 2



REWORK INSTRUCTIONS

1a. CUT TRACE TO 2I-13
1b. ADD JUMPER FROM F/T TO 2I4
2a. ADD JUMPER FROM 4C15 TO 4C14
3a. ADD JUMPER FROM 4C11 TO 4C10
4. ADD JUMPER FROM 4a TO 4b

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DATE: 1/80			
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